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## Contribute to the knowledge of the presence and distribution of cetaceans in the Aegean Sea

**Abstract** – Data about the cetaceans in the Aegean Sea are scarce. Most information comes from strandings or occasional sightings at sea, often reported by unskilled observers. In 1993, 1994 and 1997 some cruises on board of oceanographic ships, ferries and trawlers were carried out for the first time to obtain information about the distribution of cetaceans in that area. Strandings occurred in the Dodecanese islands between 1991 and 1996 were recorded. *Tursiops truncatus* was observed all around the Aegean Sea, while *Delphinus delphis* was sighted only in the eastern part of the basin. *Stenella coeruleoalba* is common in deep waters. Individuals of *Grampus griseus* have been observed at sea in the Aegean Sea; this report constitutes the first record of this species in this part of the Mediterranean Sea. *Ziphius cavirostris* is probably less rare than it was deemed in the past. *Physeter macrocephalus* and *Balaenoptera physalus* were observed only to south of the Peloponnese, Crete and Turkish coasts, but there are reports of their occasional presence also in the northern waters. The marine area south of Karpathos island and around the island of Rhodes is particularly rich in cetological fauna, while there have been very few sightings in the Cyclades Archipelago waters. Interactions with fishery activities have been recorded in the eastern area of the basin.

**Key words:** Cetaceans, Mediterranean Sea, Aegean Sea, sighting, stranding.

**Riassunto** – Presenza e distribuzione della fauna cetologica nel Mar Egeo.

Le conoscenze riguardanti la fauna cetologica del Mar Egeo sono assai scarse. La maggior parte delle informazioni viene dagli spiaggiamenti o da avvistamenti occasionali in mare riportati, spesso, da personale non specializzato. Nel 1993, 1994 e nel 1997, per la prima volta nell'area, sono state realizzate alcune crociere per raccogliere dati sui cetacei: le campagne di osservazione sono state condotte da bordo di navi oceanografiche, pescherecci e traghetti di linea. Sono stati inoltre raccolti dati di prima mano sugli spiaggiamenti verificatisi nelle isole del Dodecaneso tra il 1991 e il 1996. Il tursiopo, *Tursiops truncatus*, sembra essere ben distribuito in tutto l'Egeo, mentre individui di delfino comune, *Delphinus delphis*, sono stati osservati solo nella parte orientale del bacino. La stenella, *Stenella coeruleoalba*, è comune in acque profonde. Per la prima volta è stata osservata la presenza di *Grampus griseus* in mare aperto nell'Egeo. *Ziphius cavirostris* è specie probabilmente meno rara di quanto si ritenesse in passato. Il capodoglio, *Physeter macrocephalus*, e la balenottera comune *Balaenoptera physalus* sono stati osservati solo a sud del Peloponneso, di Creta e della costa turca, ma esistono segnalazioni, anche recenti, di occasionali avvistamenti anche nelle acque più settentrionali. L'area a sud dell'isola di Karpathos e attorno all'isola di Rodi è particolarmente abbondante in fauna cetologica, mentre pochissimi avvistamenti sono stati registrati nelle acque dell'arcipelago delle Sporadi. Interazioni con le attività di pesca sono state registrate nella porzione orientale del bacino.

**Parole chiave:** Cetacei, Mare Mediterraneo, Mare Egeo, osservazione, spiaggiamento.

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## Introduction

Information on the presence of cetaceans in the Aegean Sea is poor. The largest part of the data comes from reports of strandings of dead or dying specimens; very few data come from direct sightings at sea. Many publications dealt with the die-off which affected striped dolphins (*Stenella coeruleoalba* Meyen, 1833) in the Greek seas, between 1991 and 1992 (Bei et al., 1993; Cebrian, 1992; Georgakopoulou-Gregoriadou et al., 1993; Giagnisi et al., 1993; Androukaki & Tounta, 1994; Cebrian, 1995). Papers which have been prepared on the basis of reports from unskilled observers at sea (Pilleri & Pilleri, 1987) are probably affected by serious biases due to erroneous identification of the species. Furthermore, they never include indications about the relative density of cetological fauna. A dedicated cruise was recently carried out in the Turkish waters by Topaloglu et al. (1990). At this moment, the best information about the presence of marine mammals in the Eastern Mediterranean Sea and in the Aegean Sea comes from the works of Marchessaux & Duguy (1979) and Marchessaux (1980), but is largely based on museological materials and only partially supported by direct, occasional sightings.

The presence of striped dolphin, common dolphin (*Delphinus delphis* Linnaeus, 1758), bottlenose dolphin (*Tursiops truncatu* Montagu, 1821), sperm whale (*Physeter macrocephalus* Linnaeus, 1758), Cuvier's beaked whale (*Ziphius cavirostris* G. Cuvier, 1823) and fin whale (*Balaenoptera physalus* Linnaeus, 1758) is considered as fair common in the area (Marchessaux, 1980). Although Kinzelbach (1986) indicated the presence of Risso's dolphin (*Grampus griseus* G. Cuvier, 1812) in the Aegean Sea by a stranding, individuals of this species were never observed at sea. Cebrian & Papaconstantinou (1992) mention the presence of long-finned pilot whale (*Globicephala melas* Traill, 1809). However this species is common in the western and it is not rare in the central part of the Mediterranean Sea (e.g. Vallon et al., 1977; Raga et al., 1988; Hashmi, 1990, Notarbartolo di Sciara et al., 1993), but there are no convincing documents (photos or videos), or sightings by skilled observers that confirm its presence in the Aegean Sea. Androukaki & Tounta (1994) report the stranding of a single specimen in Greece, but they do not specify if it occurred along the Ionian or the Aegean Sea coasts. Other species of cetaceans which have been reported in the Western Mediterranean Sea, killer whale, *Orcinus orca* Linnaeus, 1758, rough-toothed dolphin, *Steno bredanensis* G. Cuvier, 1828, false killer whale, *Pseudorca crassidens* Owen, 1846, and minke whale, *Balaenoptera acutorostrata* Lacépède, 1804 were never observed at sea and stranded very rarely along the Aegean Sea coasts (Marchessaux, 1980).

Some surveys have been conducted for the first time in the summers of 1993 and 1994 to obtain a better knowledge about the presence and the distribution of the cetaceans in the Aegean Sea. The results are here presented together with data coming from strandings recorded by one of the authors (M.C.).

We also investigated the interactions between fishery activities and dolphins in the area, trying to evaluate if threats for the cetacean populations could be consistent in the area.

## Materials and methods

Three kinds of ships have been used to conduct the survey: a trawler that was carrying out a program of fishery researches, an oceanographic vessel and some different commercial ferries that have been employed as «platforms of opportunity».

In Summer 1993, occasional surveys were conducted aboard the oceanographic vessel *Philia*, of the IMBC (the deck was 6 meters high above sea level, cruising speed about 6 knots): about 727 nautical miles were covered in 30 stretches with fair sea state (Beaufort Scale < 3).

From May to September 1993 and in May 1994, ferries have been used by two of the authors (L. M. & P. C.) to conduct observations: the decks were 4 to 16 meters high above sea level and the cruising speed of the boats was between 3 and 25 knots. The observations were conducted as above described, but the coordinates of the sightings points and the sea depths were calculated on a nautical map, interpolating the leaving and arriving time of the boat. The routes covered more than 4500 nautical miles in fair weather conditions during 55 bouts. Two particular routes were repeated many times: Iraklion - Santorini (and return) has been repeated 14 times and the route Iraklion - Karpathos - Rhodes (and return) was covered 19 times, with fair sea state.

In May and June 1994 and in June 1997, the research has been carried out from two trawlers (the *Ioannis Rossos* and the *Capt. Paraskos*) that were employed for researches about fishery stocks by the Institute of Marine Biology of Crete (IMBC), the National Center for Marine Research of Athens and the Fisheries Research Center of Kavala. The sighting decks were about six meters high above sea level and the ships were cruising at speeds between four and nine knots. About one hundred and sixty four hours of active searching have been conducted along a 1238 nautical miles route (25 stretches). Sea depth was between 30 and 650 meters. The surface water temperature was measured each hour by an electronic thermometer and was comprised between 19 and 24 °C. Sightings were conducted with a naked eye and confirmed with the aid of binoculars (12 x 50 and a 7 x 30 with a graduated scale for the evaluation of the distance). The sighting positions were recorded by the Global Position System (GPS) and the depth was checked by an echo sounder. Meteorological data and the presence of other marine organisms (birds and sharks) were also recorded.

All the routes are reported in Fig. 1. As we were not able to choose the routes independently, their layout has to be considered as absolutely *random* and no special sampling strategy was applied.

In occasion of the surveys, we carried out 41 interviews with the local fishing communities and Authorities asking about interactions of delphinids with traditional fishery activities (gillnets) in two harbours of the Athens region (Porto Rafti and Peiraias), in eight harbours of Criti island (Iraklion, Itanos, Lendas, Vai, Agia Pelagia, Kisamos, Makrigialos and Ierapetra) and on the islands of Santorini, Samos, Lesbos, Rhodes, Patmos, Siros and Evvoia (Kymi harbour). The interviews were based on a very simple scheme to avoid subjective points of view and biased opinions of the fishermen. Basic information was requested about the nature of fishery, present and past occurrence of delphinids in the area, if the occurrence is steady,

seasonal or accidental, if the delphinids stay offshore or are coastal, if there are interactions with fishery activities.

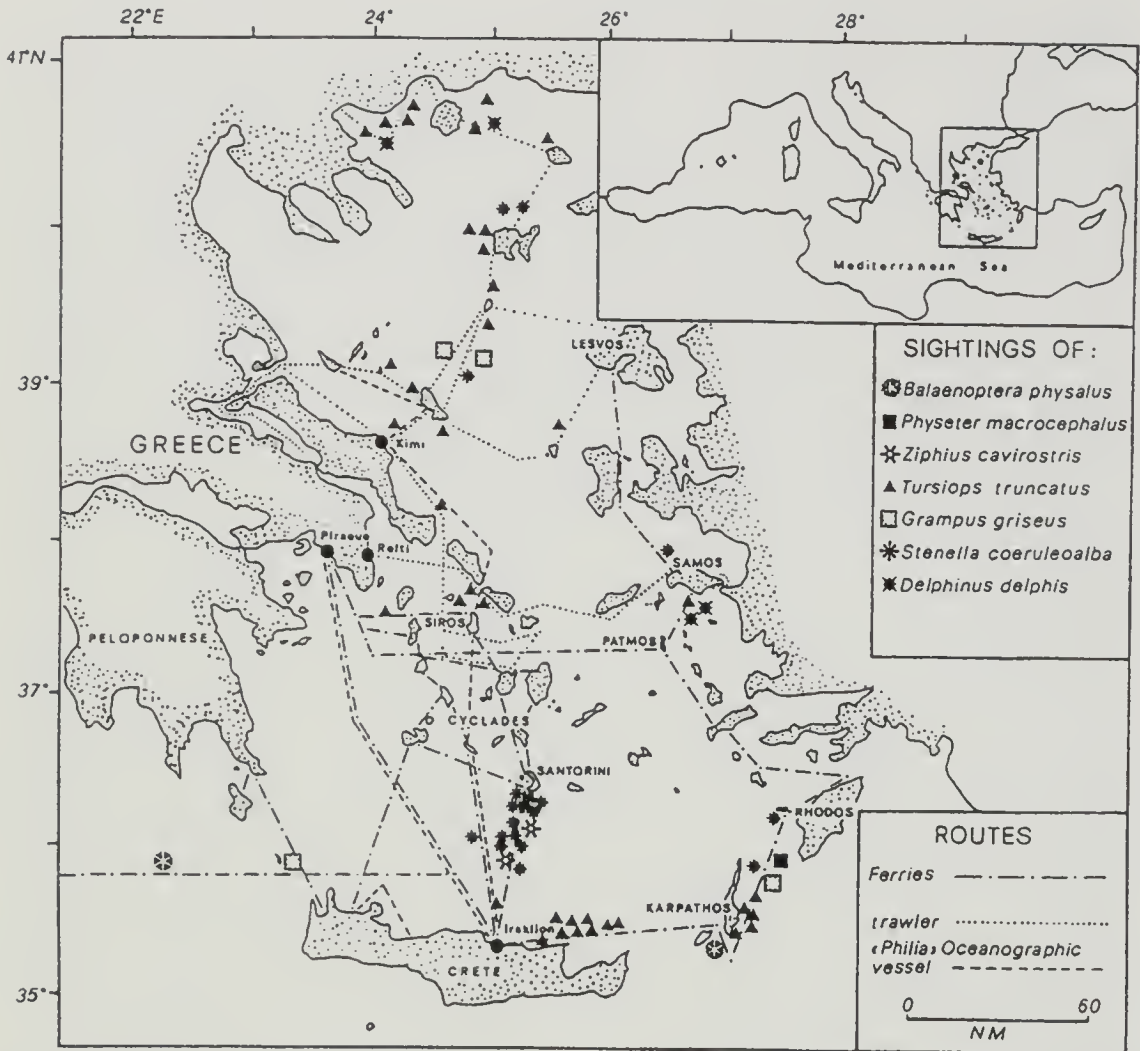


Fig. 1 - Cruises carried out during the research and the sightings of cetaceans reported during the observations in the Aegean Sea.

## Results

A total of 69 cetacean sightings have been recorded during all the cruises. Bottlenose dolphin has been observed 37 times (53.6% of the total), striped dolphin 19 times (27.5%), Risso's dolphin 4 times, common dolphin 4 times each (5.8%), fin whale and Cuvier's beaked whale 2 times (2.9%) each, sperm whale once (1.4%) (Fig. 1). Moreover, 21 sightings (23.3% of the total) of unidentified dolphins have been recorded. Based on reported size and behaviour, these animals were probably bottlenose dolphin, or striped dolphin or common dolphin. These sightings will not be considered in the discussion of data that follows.

Along the route Iraklion-Santorini and return with fair sea conditions (14 trips), 18 sightings were recorded along a total of about 914 nautical miles (nm) with a ratio of 0.019 sightings/nm. Along the route Iraklion-Karpathos-Halki-Rhodes and return (20 bouts for a total of about 1536 miles) 20 sightings were recorded with a ratio of 0.013 sightings/nm with

fair sea conditions. Within this route, the stretch between Halki and the southern point of Karpathos (about 56 nm) shows a relatively high ratio which is similar to the one recorded between Iraklion and Santorini (sightings/nm = 0.020). Observations carried out in the Cyclades islands area give a ratio of 0.006 sightings/nm (8 sightings along 1004 nm). The calculated ratio for sightings recorded from the *Ioannis Rossos* in the area between the northern Sporads Islands and the Cyclades Archipelago, with fair sea conditions (472 nautical miles for 12 sightings of recognized species) was similar (0.025 sightings/nm) to that recorded between Santorini and Iraklion. A total of 140 nm were patrolled in the area between the mainland and the Euboea Island: we did not record any sightings despite the fair sea conditions. The northern and northeastern part of the Aegean sea was surveyed in June 1997 (15 sightings along 450 nautical miles) with a relatively high sighting/hour ratio (0.033).

Different group sizes, per species, are summarized in table 1. Only solitary individuals of *Balaenoptera physalus* and *Physeter macrocephalus* were sighted, while both sightings of *Zifius cavirostris* refer to couples of individuals. Data relative to the sea depth in sighting spots are reported in table 2. Fin whales were observed both in continental shelf waters and in deep waters, while Cuvier's beaked whales were sighted in water more than 1000 m deep. Sperm whale was seen close to the continental slope.

Table 1 - Group size statistics.

Species	N	Range	Mean	Median	SD	SE
<i>Delphinus delphis</i>	4	2-8	4.25	3.5	2.63	1.315
<i>Grampus griseus</i>	4	2-15	8	7.5	5.477	2.738
<i>Stenella coeruleoalba</i>	19	1-50	10	5	12.61	2.61
<i>Tursiops truncatus</i>	36	1-15	4.44	3	3.47	0.58

N = number of sighted groups; all the others data refer to the number of animals per group.

Table 2 - Water depth at sighting locations for different species (in meters)

Species	N	Range	Mean	Median	SD	SE
<i>Delphinus delphis</i>	4	56 - 82	67	65	12.27	6.13
<i>Grampus griseus</i>	4	500 - 700	600.5	601	93.9	46.9
<i>Stenella coeruleoalba</i>	18	190 - 1605	763	755	368.5	86.86
<i>Tursiops truncatus</i>	27	30 - 546	186.6	182	127.8	24.6

N = number of sighted groups; all the others data refer to the depth of the sea.

Trawling activities were carried out during one of the sightings of Riso's dolphin recorded aboard of the *Ioannis Rossos*: among the catches, we observed some specimen of a squid (*Todarodes sagittatus* Lamarck, 1798) that is known to be a prey of that cetacean species. Evidently, the observed specimens were feeding on the same school which the trawler was fishing.

In one occasion, two bottlenose dolphins were observed to chase a shark. Bottlenose dolphins are quite confident toward the boats and in 33.3% of the recorded sightings from the *Ioannis Rossos* the animals performed bowriding behaviour.

From 1991 to 1996, 51 strandings of cetaceans have been recorded along the coasts of the Dodecannese Islands of Rhodes, Kos and Leros (Tab. 3). Stranding distribution is shown in Fig. 2. Moreover, the stranding of a Risso's dolphin along the coasts of Rhodes in the second half of seventies has been reported. The specimen formerly kept at the Museum of the aquarium of Rhodes has now deteriorated and is no more available. In the same Museum, a stuffed Cuvier's beaked whale, stranded in Rhodes in 1960, is preserved. Some measurements of stranded specimens are reported in table 4.

Table 3 - Strandings of cetaceans along the coasts of the Dodecannese islands

Species	1991	1992	1993	1994	1995	1996	Total
<i>Tursiops truncatus</i>	-	-	1	-	1	-	2
<i>Stenella coeruleoalba</i>	7	11	1	2	1	-	22
<i>Grampus griseus</i>	-	-	-	1	-	-	1
<i>Ziphius cavirostris</i>	4	2	-	-	1	1	8
Not-id. Delphinidae	-	13	1	2	2	-	18

Table 4 - Length of stranded specimens of four species of cetaceans (in meters)

Species	N	Range	Mean	SD
<i>Tursiops truncatus</i>	2	2.4 - 3	2.7	0.42
<i>Stenella coeruleoalba</i> , adult (>1 mt)	19	1.2 - 2.2	1.88	0.26
<i>Ziphius cavirostris</i>	7	4.5 - 5.25	4.5	0.24

Although we have no causes of death, most of the strandings of striped dolphin we recorded in Rhodes island in 1991 and 1992 (18 of 22), correspond to the period of expansion and culmination of the epizootic caused by the dolphin morbillivirus infection (DMV), which spread around the Mediterranean (Aguilar & Raga, 1993). So, the morbillivirus was probably responsible for at least some of these deaths.

Generally speaking, fishermen were not able to specify the observed species, referring to the animals as «dolphins» (or, sometimes, as  $\theta\epsilon\rho\iota\omicron$  = Theriò, large animal, monster). In one occasion, only a fisherman was able to describe accurately the differences among *Tursiops truncatus*, *Delphinus delphis* and *Stenella coeruleoalba*.

Heavy damages to the nets and removals of fishes from the nets have been described by the fishermen in the islands (except Santorini). On the other hand, no interaction has been reported along the eastern coast of Attica. In Crete interactions seem to be very sporadic. We examined some gill-nets in Lesvos and Patmos that were claimed to be damaged by dolphins:

they present holes very similar to those observed in Sardinia (Marini, 1994). Entanglements of dolphins seem to be very rare. No interactions are reported with fishing gears other than gillnets. However, fishermen of the North Aegean support that dolphins can damage trawling nets as well, while seeking for an easy meal.

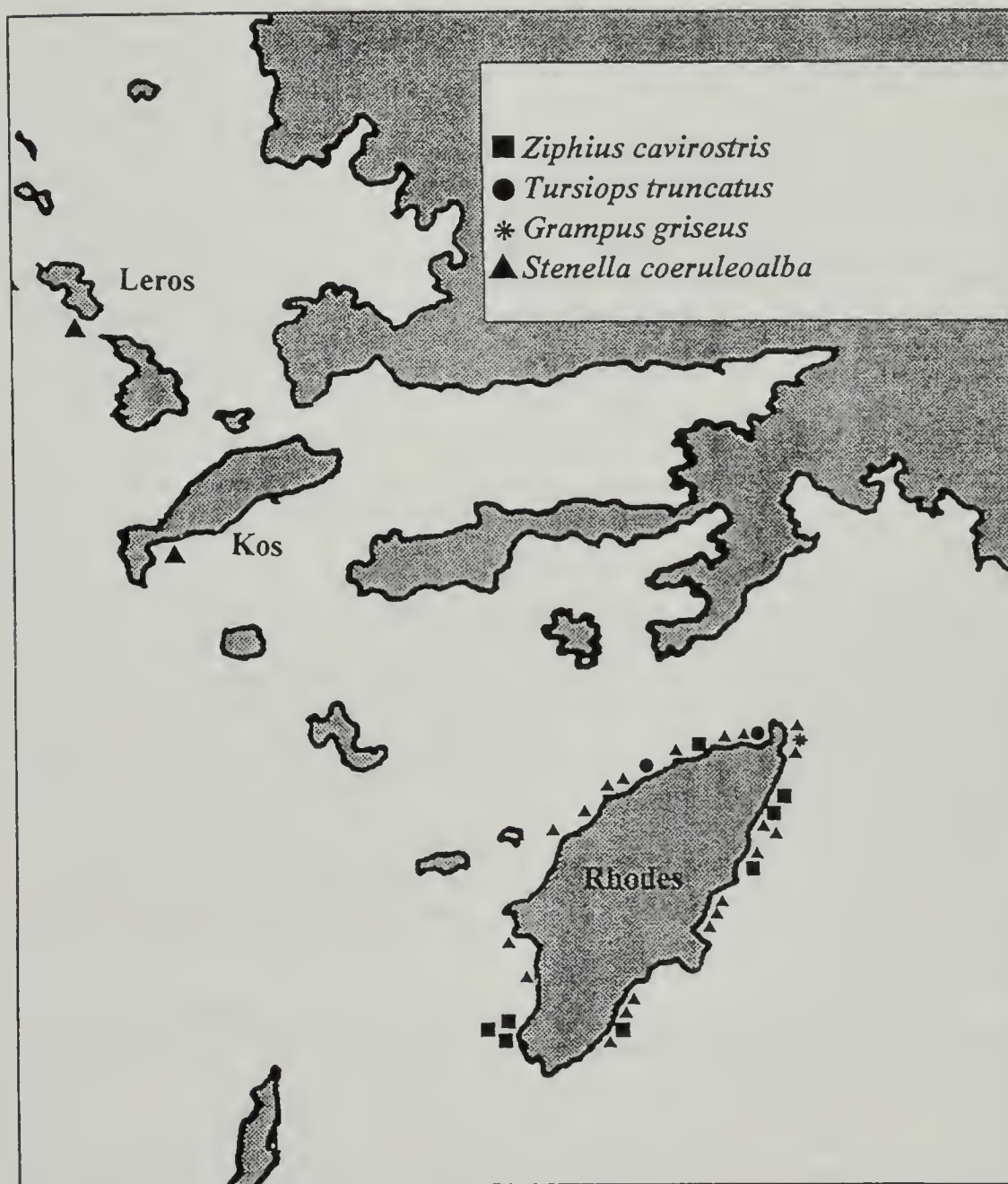


Fig. 2 - Strandings of cetaceans recorded along the coasts of the Dodecanese islands (1991-1996).

### Discussion

This work represents the first attempt to evaluate the presence of cetaceans in the Aegean Sea by a series of dedicated observations and is

the largest first-hand information gathering concerning sightings and strandings in that area so far. Although some areas remain unexplored (i.e., the northwestern part) or require further researches (the eastern part and the area between the Cyclades Islands and the Peloponnese), these first results present some interesting points.

For what concerns the relative density, the observed ratios sighting/nautical mile for the southern and the central areas are very similar to the ones obtained during the survey carried out in the Central Tyrrhenian Sea using similar methodologies (0.0187) (Marini et al., 1996). The highest density has been recorded in the northeastern area, but the species diversity is quite low, only three species having been sighted.

The relatively high frequencies in sightings recorded between Rhodes and Karpathos could be related with the upwelling phenomena (Pancucci-Papadopoulou et al., 1992) occurring to the east and southeast of Rhodes island and, at least in some seasons, to the southeast of Crete. On the contrary, the presence of cetaceans in the waters of the Cyclades Archipelago appears to be quite scarce. We were not able to observe any animal in the northern Euboea Gulf, although fishermen assert that «dolphins» are very common in other seasons.

Five species (*B. physalus*, *P. macrocephalus*, *G. griseus*, *T. truncatus* and *S. coeruleoalba*) out of the seven that were observed in all the basin were sighted or stranded in the area south east of Karpathos Island and around the island of Rhodes.

The presence of fin whale has been observed only in the continental slope area in the southern part of the Aegean Sea. Marchessaux & Duguy (1979) report a sighting south of Crete and some strandings along the south-eastern part of the Mediterranean basin, especially in the winter months. It would seem that this species enters but rarely the shallow waters of the Aegean Sea. However, local press recently (Autumn 1997) reported the stranding of a fin whale in the harbour of Kavala (northern coasts of the Aegean Sea).

*Sperm whale* has been observed in the same area and we obtained a very reliable report of a sighting in the central area by a sailor. Moreover, Marchessaux & Duguy (1979) report a sighting north of the Cyclades Archipelago. This shows that the species occasionally enters also the inner part of the Aegean Sea.

Marchessaux & Duguy (1979) report some strandings of Cuvier's beaked whales in the Rhodes area and another one in the north-eastern part of the basin and regard this species as fairly common. We observed some groups of Cuvier's beaked whales between Crete and Santorini; furthermore, Cuvier's beaked whales stranded relatively often around the coast of the eastern islands. This can confirm the statement of Marchessaux and Duguy (1979) about the frequency of the species, especially in the southern part of the basin.

We recorded, for the first time, the presence of *G. griseus* in the Aegean Sea, both in the central and in the south-eastern part of the basin, close to Karpathos island. Furthermore, a Risso's dolphin stranding was recorded in Rhodes. Probably this species is quite common in all the basin, where it could find fair trophic conditions.



The presence of false killer whale in the area is not confirmed by any sighting but the resemblance of its surfacing profile with *T. truncatus* makes difficult to evaluate its presence.

*S. coeruleoalba*, which is generally regarded as a pelagic species, seems to be very common in all the deeper waters of the basin (89% of sightings in water deeper than 200 m). It has never been observed in the Cyclades Archipelago.

Common dolphins are surely present in the eastern part of the Aegean Sea (see also Topaloglu et al., 1990), and in the northern waters but probably also around some islands in the central Aegean Sea. This species seems to prefer a coastal habitat, sharing it with *T. truncatus*, as we observed around the island of Samos (see also Politi et al., 1994, for the Ionian waters). Marchessaux & Duguy (1979) conclude that *D. delphis* «may not be abundant», but probably it is more common in the eastern Aegean waters and close to the Greek Ionian coast (Angelici & Marini., 1992; Politi et al., 1994) than in the central and western Mediterranean.

Bottlenose dolphin is quite common all around the basin and seems to be the more frequent species in the Cyclades Archipelago. It is widespread in the shallow waters around the islands (68% of the sightings in water deep less than 200 m) but also in deeper areas (up to over 500 m).

Mean group sizes of any species are smaller than those observed in the central Mediterranean Sea by Notarbartolo di Sciara et al. (1993). Only the groups of bottlenose dolphin have similar mean size (4.44 versus 6.64) with lower peaks values (15 versus 40). Seen as a whole, there are no significant differences between mean group sizes in the Aegean Sea and the Central Tyrrhenian Sea as reported by Marini et al. (1996) ( $p \gg 0.05$ , Sign test).

As the interactions with fishery are concerned, fishermen in some islands shoot the dolphins to frighten them and it is very probable that some killing occurs. Berkes (1977) reports that Aegean Turkish fishermen complain about damages made from the «dolphins» to the nets but that they do not hunt them, believing it is a sinful to do so. In some islands (e.g., Lesbos) shooting is limited by the intense military presence. Fishermen showed us firecrackers used to frighten the «dolphins». Anyway they admit that the animals are not affected by this device. Sardinian fishermen use the same method, without results.

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